

# APPLICATION UNDER UNITED STATES PATENT LAWS

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(M#)

Invention: **MOLDED ELECTRONIC ASSEMBLY**

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### This is a:

- ☐ Provisional Application
- ☒ Regular Utility Application
- ☐ Continuing Application
  - ☐ The contents of the parent are incorporated by reference
- ☐ PCT National Phase Application
- ☐ Design Application
- ☐ Reissue Application
- ☐ Plant Application
- ☐ Substitute Specification
  - Sub. Spec Filed \_\_\_\_\_
  - in App. No. \_\_\_\_\_ / \_\_\_\_\_
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  - Sub. Spec. filed \_\_\_\_\_
  - In App. No. \_\_\_\_\_ / \_\_\_\_\_

## **SPECIFICATION**

## MOLDED ELECTRONIC ASSEMBLY

### CROSS-REFERENCE TO RELATED APPLICATION

5 The present application claims the benefit of  
Provisional Application No. 60/441,140, filed January  
17, 2003, and titled MOLDED ELECTRONIC ASSEMBLY.

### FIELD OF THE INVENTION

10 The present invention relates generally to the  
field of electrical wiring assemblies, and more  
particularly to a molded electronic assembly for  
electrically interconnecting devices and wiring and  
bus systems in aircraft.

### DESCRIPTION OF THE PRIOR ART

15 Currently, aircraft wiring and bus systems are  
implemented in integrated wiring systems. Integrated  
wiring systems include wiring harnesses and integrated  
wiring assemblies. Integrated wiring assemblies are  
20 used to interconnect wiring harnesses and to connect  
devices to the wiring harnesses.

A wiring integration assembly includes a metal  
chassis, typically of welded, brazed or cast  
construction, having one or more wiring harnesses  
25 disposed therein. Connectors are affixed to the  
chassis to provide connections to the wiring  
harnesses.

Wiring integration assemblies tend to be  
expensive, heavy, bulky, and subject to environmental  
30 constraints. Welded and brazed chassis construction  
involve many details, with expensive recurring  
process, and provide considerable variability in  
products. Cast chassis are expensive to make and have

poor material properties. Cast chassis need thick walls in order to have sufficient mechanical strength. Thick walls lead to more material expense and weight. A shortcoming all current chassis constructions is  
5 that their robust box strength drives loads into the aircraft structure.

A further shortcoming of current integrated wiring assemblies is in their relatively part counts. Current integrated wiring assemblies include such  
10 parts as nut plates, retainers, screws, washers, covers, pads, seals, internal harnesses, relay panels, and strain reliefs. All of these parts increase the cost, weight and complexity of the integrated wiring assemblies.

15 Environmental shortcomings of current integrated wiring assemblies include internal accumulation of contaminants such as moisture, fluids, salts and particulates. All of these environmental contaminants can result in corrosion, shorting and other problems.  
20 Wiring integration assemblies in aircraft are also subject to vibrations. In most cases, the internal wiring harnesses are unsupported in the chassis. Vibration can lead to chafing and failure of wiring insulation, and loads and potential failure of wiring  
25 connections.

#### SUMMARY OF THE INVENTION

The present invention provides a molded electronic assembly. The molded electronic assembly  
30 of the present invention includes a wiring harness with connectors connected thereto, and a molded body formed to encapsulate the wiring harness and provide access to the connectors. The molded may comprise a

plastic material such as polyurethane or other moldable material. A conductive coating may be placed on the outer surface of the molded body to provide electrical shielding. Additionally, the wiring harness may be shielded with a wrapping of metallic tape or the like. The molded electronic assembly of the present invention may include a grounding fixture or grommet that provides mechanical properties of a structural fixture and allows for ground wires to be terminated. The molded electronic assembly of the present invention has fewer parts and less volume, weighs and costs less, is more reliable and has less environmental susceptibility than the wiring integration assemblies of the prior art.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an isometric view of a molded wiring assembly according to the present invention.

Figure 2 is a top view of the molded wiring assembly of Figure 1.

Figure 3 is a top view of a first wiring harness according to the present invention.

Figure 4 is a top view of a second wiring harness according to the present invention.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, and first to Figures 1 and 2, a molded electronic assembly is designated generally by the numeral 11. Molded electronic assembly includes a molded body 13, which encapsulates one or more wiring harnesses (not shown in Figures 1 and 2) that will be described in detail with respect to Figures 3 and 4. Molded body 13 is

formed from a moldable plastic material such as polyurethane. Other plastic materials such as Hexcell™, Hycor™, silicone or that like may be used to form molded body 13. The material of molded body 13 should have sufficient strength, hardness and other mechanical and electrical properties for use as a replacement for an aircraft integrated wiring assembly.

Molded body 13 may be covered with a conductive coating 15 to provide electrical shielding to the wiring harness or harnesses. A suitable conductive coating may be provided by a conductive paint, such a silver loaded composition. A conductive coating may also be provided by a metallic coating. For example, the coating 15 may be formed by electroplating or electroless plating the surface with of molded by 11 with copper or nickel. Those skilled in the art will recognize alternative materials and technologies for applying coating 15.

Molded electronic assembly 11 includes mounting fixtures 17 connected to molded body 13. Mounting fixtures 17 provide a means for attaching molded electronic assembly 11 to the structure of the aircraft. Mounting fixtures 17 may comprise metal straps, grommets, or the like, molded into molded body 13. For example, copper straps can extend between fixtures 17a and 17d and between fixtures 17b and 17c. Mounting fixtures 17 may also serve as ground connections to provide a conductive path to the structure of the aircraft. As shown in Figures 1 and 2 mounting fixtures 17 may include captive mounting hardware, such as bolts.

Molded electronic assembly 11 includes external connectors 19. As will be discussed with respect to Figures 3 and 4, connectors 19 are connected to the wiring harness or harnesses encapsulated within molded body 13. Connectors 19 are of conventional construction and they may be molded into molded body 13, thereby not requiring separate fastening means as in the prior art. Connectors 19 may include integral strain reliefs.

Molded electronic assembly 11 may include a socket plate 21 molded into molded body 13. As will be discussed with respect to Figures 3 and 4, socket plate 21 is connected to the wiring harness or harnesses encapsulated within molded body 13. Socket plate 21 is adapted to have mounted thereto an external device, such as a relay box 23 or the like, and establish a connection between the external device and the internal wiring harness or harnesses.

Referring now to Figures 3 and 4, a first wiring harness is designated generally by the numeral 25 and a second wiring harness is designated generally by the numeral 27. As shown in Figures 3 and 4, both wiring harnesses 25 and 27 include some common connectors 19. Both wiring harnesses 25 and 27 are encapsulated within molded body 13 as shown in Figures 1 and 2. Wiring harness 25 includes wiring bundles 29 that interconnect connectors 19a, 19b, 19e and 19f. Wiring bundles 29 may be covered with a shielding material such as metallic tape or foil. Wiring harness 27 includes wiring bundles 31 that interconnect connectors 19a, 19b, 19c, 19d and 19f, and socket plate 21. Wiring bundles 29 may be covered with a shielding material such as metallic tape or foil. It

will be recognized that the connections illustrated in Figures 3 and 4 are by way of example and not of limitation. The connections are made to accomplish the electrical design objectives.

5           In construction, wiring bundles 29 and 31 are connected to connectors 19 and socket plate 21 as shown, for example in Figures 3 and 4. Wiring bundles 29 and 31, connectors 19 and socket plate 21 are then placed in a suitable mold (not shown). The straps or  
10           grommets of mounting fixtures 17 are also placed in the mold. The material of molded body 13 is then injected into the mold using know molding techniques. After the material of molded body 13 has cured, the mold is opened and molded electronic assembly 11 is  
15           removed. A conductive coating may then be applied to the surface of molded body 13.

          From the foregoing, it may be seen that the molded electronic assembly of the present invention overcomes many of the shortcomings of the prior art.  
20           The system of the present invention eliminates the cost, size and weight associated with metallic chassis of the prior art. The wiring harnesses of the present invention are completely encapsulated and thereby isolated from the environment. The molded electronic  
25           assembly of the present invention eliminates most of the part count associated with integrated wiring assemblies of the prior art.

          While the present invention has been described with reference to preferred embodiments, this  
30           description is not intended to be construed in a limiting sense. Various modifications and combinations of elements, as well as other embodiments

of the invention, will be apparent to those skilled in the art given the benefit of this description.